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(56) Documents Cited
GB 2143979 A GB 1193029 A US 4520352 A
US 4453159 A US 4134092 A

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(71) Applicant(s)
John Cross McNab
398 Chillingham Road, Heaton,
NEWCASTLE-UPON-TYNE, NE6 5QX, United Kingdom

(72) Inventor(s)
John Cross McNab

(74) Agent and/or Address for Service
John Cross McNab
398 Chillingham Road, Heaton,
NEWCASTLE-UPON-TYNE, NE6 5QX, United Kingdom

(54) Heat and compression detection cable

(57) A cable is capable of detecting the application of heat or pressure above a certain level at any point along its length; the location of the point can then be determined by a loop test. The cable described has an outer sleeve 1 of heat-shrinkable plastics and an outer braid or foil layer 2 spaced, e.g. by means of a helical wrap 6, from a core 4. The latter comprises a resistance wire 5 wrapped around an insulated wire or wires 7 used to carry current to the far end of the wire 5 for the loop test.

FIG1

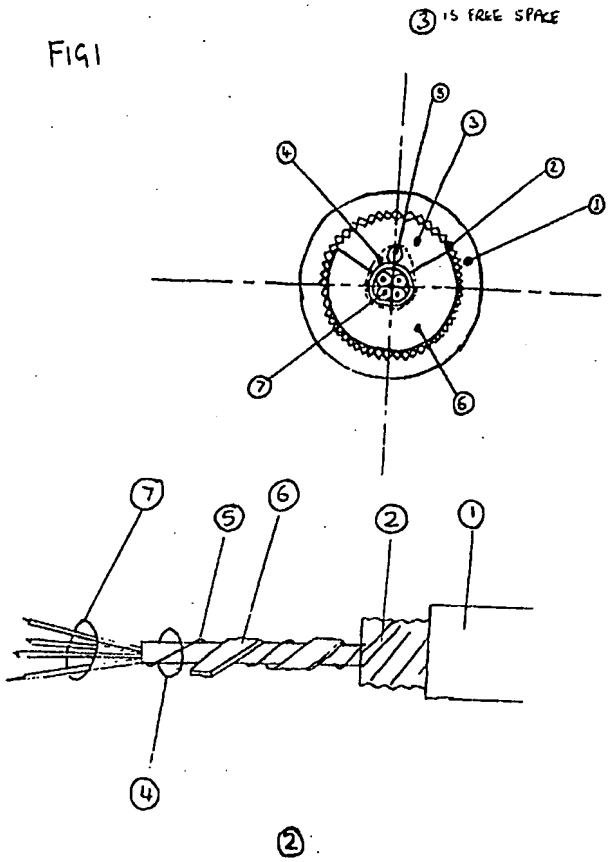

FIG 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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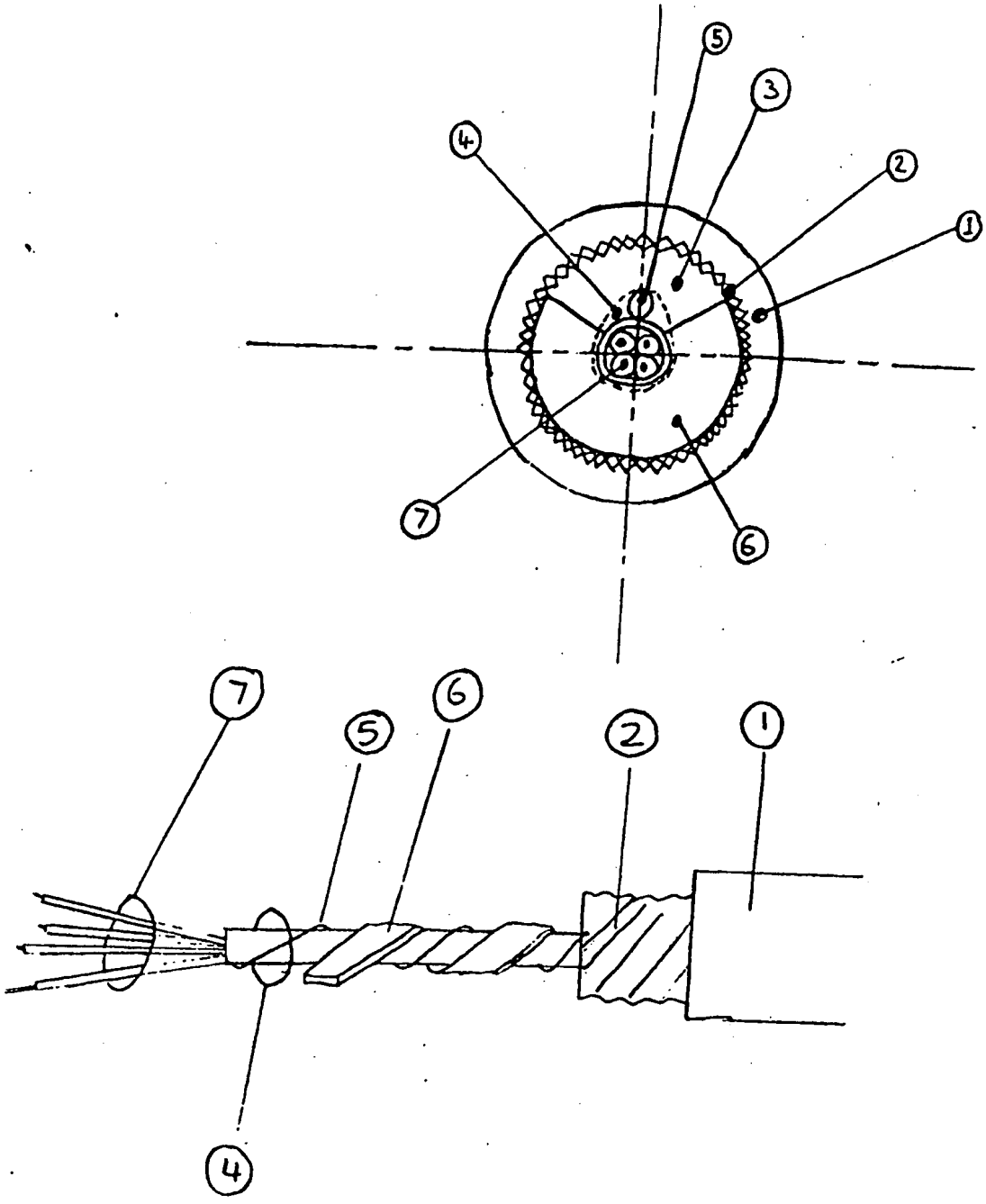
(3) IS FREE SPACE

FIG1



2

Fig 2 A

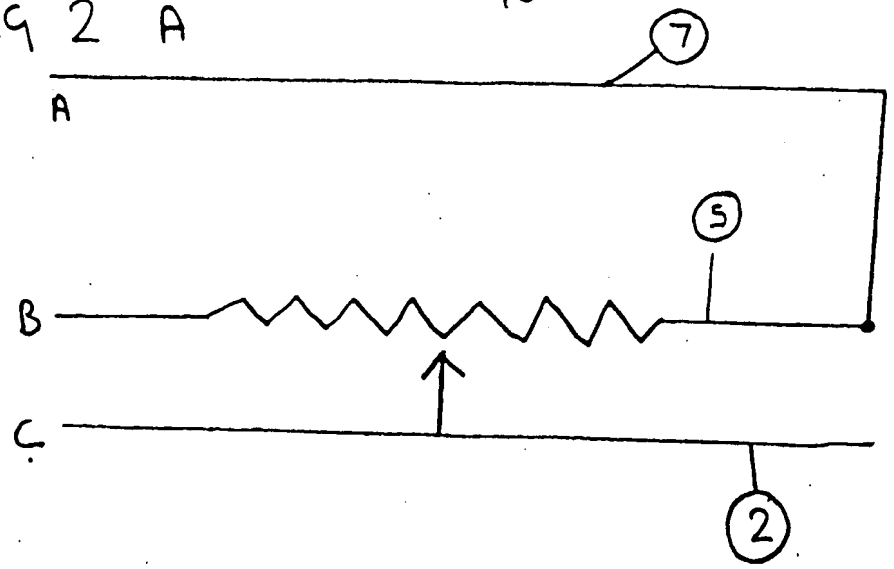
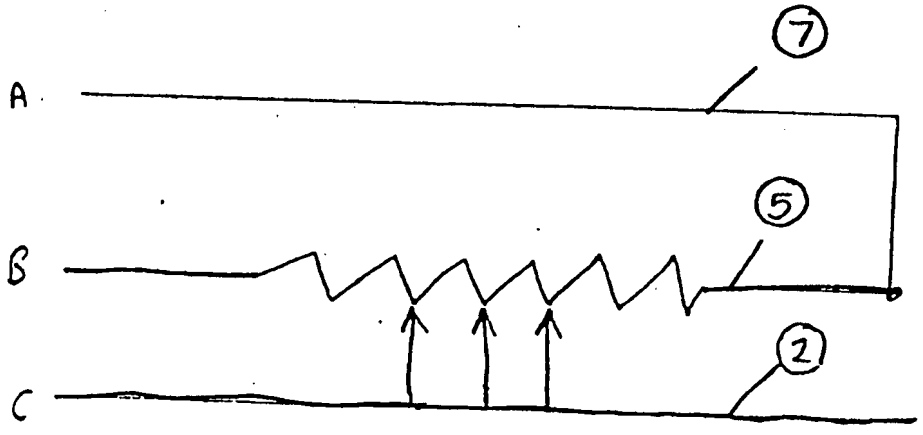


Fig 2 B



3

THIS INVENTION RELATES TO A CABLE THAT CAN DETECT HEAT OR COMMPRESSION ABOVE A CERTAIN LEVEL.IN RELATION TO THE CABLES LENGTH.IT CAN ALSO DETECT THE RATE OF SPREAD OF ANY AFFECTED PART OF THE CABLE.

THE NEED FOR INFORMATION DURING A FIRE OR A BUILDING COLLAPSE SITUATION IS OF OBVIOUS IMPORTANCE.

THE CABLE CAN DETECT HEAT OR COMPRESSION ABOVE CERTAIN LEVELS. WHEN EITHER OR THE ABOVE CONDITIONS AFFECT THE CABLE. IT IS POSSIBLE TO LOCATE THE POSITION IN RELATION TO THE CABLES LENGTH OF THE FIRST AFFECTED PART OF THE CABLE. IT CAN THEN DETECT THE SPREAD OF THE AFFECTED AREA.USING SIMPLE SENSING ELECTRONIC CIRCUITS.

THE SPECIFIC EMBODIMENT OF THE INVENTION WILL NOW BE DESCRIBED BY WAY OF AN EXAMPLE WITH REFERENCE TO THE ACCOMPANYING DRAWINGS.

FIG.1 SHOWS THE CROSSECTION AND SAMPLE LENGTH OF THE CABLE.

FIG.2 SHOWS THE METHODS OF INFORMATION RECOVERY FROM THE CABLE.

THE CABLE WHOSE CROSSECTION AND SAMPLE LENGTH ARE SHOWN IN FIG.1 .THE OUTER SLEEVE 1 OF THE CABLE IS MADE OF A HEAT SHRINKABLE PLASTIC WHICH AT NORMAL TEMPERATURE HAS ELASTIC DEFORMATION AND WHEN EXPOSED TO EXCESSIVE HEAT IT THEN SHRINKS WITH PLASTIC DEFORMATION.

WHEN THE OUTER SLEEVE 1 COMPRESSES EITHER DUE TO HEAT OR PRESSURE IT CONNECTS THE BRAID .FOIL OR COMPOSITE 2 TO THE CENTER CORE 4. THE CENTER CORE 4 IS MADE UP OF HIGH TEMPERATURE INSULATED WIRE 7 OR WIRES WRAPED BY A RESISTANCE WIRE 5.THE BRAID 2 IS ATTACHED TO THE INSIDE OF THE OUTER SLEEVE 1.

AN EXAMPLE OF A METHOD OF SPACING IS THE SPIRAL INNER 6 WHICH ALLOWS THE CABLE TO BE EASILY HANDLED BUT RESPOND TO HEAT OR COMPRESSION.

THE RESISTANCE WIRE 5 IS THE METHOD OF DISTANCE MEASUREMENT WITHIN THE CABLE AS SHOWN IN FIG 2 A WHICH IS IN THE FORM OF A POTENTIOMETER FOR THE FIRST AFFECTED PART OF THE CABLE. ONE OF THE HIGH TEMPERATURE WIRES 7 IN THE CENTER CORE 4 CONNECTS TO THE RESISTANCE WIRE TO SUPPLY THE VOLTAGE ACROSS THE RESISTANCE WIRE AND ALSO TO GIVE A CURRENT LOOP CHECK ON THE CABLE ITSELF TO ACT AS A FAILSAFE.
THE VOLTAGE PICKED UP FROM THE FIRST CONTACT IS RETURNED VIA THE BRAID 2 TO A SUITABLE DETECTION CIRCUIT.

WHEN THE AFFECTED AREA OF THE CABLE SPREADS THE POTENTIOMETER METHOD BECOMES LESS RELIABLE TO DETECT DISTANCE SO THE METHOD SHOWN IN FIG 2B BECOMES ACTIVE. THIS METHOD WORKS SIMPLY BY MEASURING THE RESISTANCE BETWEEN POINTS A AND C AND ALSO POINTS B AND C .WITH THE RESISTANCE OF THE WIRE KNOWN THE POSITION AND SIZE OF THE AFFECTED AREA OF THE CABLE CAN BE CALCULATED ,BEARING IN MIND THE FACT THAT THE CABLE HAS A PRESET TEMPERATURE TRIGGER LEVEL THIS CAN MINIMISE ERRORS DUE TO CHANGES IN THE RESISTANCE WIRE 5 WITH TEMPERATURE.

THE METHOD OF INSTALLATION IS BY THE USE OF SUITABLE CABLE FIXINGS WHICH DO NOT COMPRESS THE CABLE.

THE CALIBRATION OF THE CABLE IS ALSO VERY EASY AS THE ENGINEER CAN MAP OUT THE CABLE BY SIMPLY COMPRESSING THE CABLE AT DIFFERENT LENGTHS ALONG THE CABLES PATH AND TAKING VOLTAGE READINGS.

CLAIMS

1 A HEAT AND COMPRESSION DETECTION CABLE THAT CAN DETECT HEAT OR COMPRESSION ABOVE CERTAIN LEVELS.WHEN EITHER OF THE ABOVE CONDITIONS AFFECT THE CABLE IT IS POSSIBLE TO LOCATE THE POSITION IN RELATION TO THE CABLES LENGTH OF THE FIRST AFFECTED PART OF THE CABLE.IT CAN THEN DETECT THE SPREAD OF THE AFFECTED AREA USING SIMPLE SENSING ELECTRONIC CIRCUITS.

2. A HEAT AND COMPRESSION DETECTING CABLE AS IN CLAIM 1 WHEREIN THE FIRST DETECTION CIRCUIT IS A POTENTIOMETER CIRCUIT WITH A CURRENT LOOP TO CHECK THE ACTIVE STATE OF THE CABLE.

3. A HEAT AND COMPRESSION DETECTING CABLE AS IN CLAIM 1. WHEREIN THE SECOND DETECTION CIRCUIT IS A POTENTIAL DIVIDER RESISTANCE MEASURING CIRCUIT.

4. A HEAT AND COMPRESSION DETECTION CABLE SUBSTANTIALLY AS DESCRIBED HEREIN WITH REFERENCE TO FIG 1-2 OF THE ACCOMPANYING DRAWINGS.

Amendments to the claims have been filed as follows

1 A cable which detects and locates heat or compression above certain levels in relation to the cables length.

The cable consists of :-

A) A flexible outer sleeve made from a suitable heat shrinkable material capable of shrinking , whose inner surface is connected by a suitable method to an electrically conductive braid foil or composite.

B) The centre core of the cable consists of a single or multicore cable capable of withstanding high temperatures. A resistance material is attached to the outer surface by a suitable method.

C) The inner conducting surface of the outer sleeve is electrically isolated from the resistance material on the centre core by a suitable method, unless a force is applied in one of the following ways.

(1) External compressive loading acting on the cable above a certain level.

(2) Compression caused by the heat shrinkable outer sleeve reducing its internal cross-sectional area due to external temperatures above the activation temperature of the heat shrinkable material , causing the outer sleeve to shrink..

D) The resistance material on the centre core acts as the method of location in the following ways.

(1) The first affected part of the cable is located by a potentiometer method of information recovery.

(2) The spread of further affected parts of the cable is located by simple resistance measurements from each end of the cable, when used with suitable supply and detection circuitry.

2 A cable according to claim 1 in which the flexible outer sleeve is made of a suitable heat shrinkable material, capable of shrinking.
The existing art in heatshrink technologies make available various material properties which can be used in relation to various cable specifications, which could include the following :-

Trigger temperature, shrink ratio, flame retardency, type of emissions during fire conditions and material handling.

3 A cable according to claims 1-2 in which an electrically conductive braid foil or composite is attached to the inner surface of the outer heatshrink sleeve which can respond to compression.

4 A cable according to claim 1 in which the centre core consists of a single or multicore cable capable of withstanding high temperatures. A resistance material is attached to the outer surface by a suitable method. The unused wires in the centre core could be used for other purposes.

5 A cable according to claims 1-4 in which the outer sleeve is electrically isolated from the resistance material attached on the centre core by a suitable method.

6 A cable according to claims 1-5 which uses the resistance material to locate the first affected part by using as a potentiometer method of distance measurement.
The method for detecting the spread of the affected areas is by means of resistance measurement from the ends of the cable. With the resistance of the wire known , the position and size of the affected area of the cable can be calculated. Bearing in mind the fact that the cable has a preset trigger temperature level this can minimise errors due to changes in the resistance wire with temperature.

7 A cable according to claim 1 , substantially as herein before described with reference to figure 1 and figure 2 of the accompanying drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) -7-	Application number GB 9306873.2
Relevant Technical Fields (i) UK Cl (Ed.M) G1N (NADC, NAFB, NARA); G4N (NCTX, NPPXP); H1N (NDT, NDX, NUK) (ii) Int Cl (Ed.5) G08B 17/06, 19/00; H01B 7/10; H01H 37/46, 37/74	Search Examiner M G CLARKE Date of completion of Search 9 JUNE 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASES: WPI	Documents considered relevant following a search in respect of Claims :- 1 to 4

Categories of documents

X:	Document indicating lack of novelty or of inventive step.	**P:**	Document published on or after the declared priority date but before the filing date of the present application.
Y:	Document indicating lack of inventive step if combined with one or more other documents of the same category.	**E:**	Patent document published on or after, but with priority date earlier than, the filing date of the present application.
A:	Document indicating technological background and/or state of the art.	**&:**	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X,Y	GB 2143979 A	(RAYCHEM CORPORATION) see especially Figures 1-22 and 34, pages 1-11 and page 13 lines 4-25	1-3
X,Y	GB 1193029	(KABEL-UND METALLWERKE etc) whole document but see especially page 2 lines 81-86	1
X	US 4453159	(Ass. to THERMON MFG CO) see especially column 3 line 30 to column 5 line 68	1,2
Y	US 4520352	(Ass. to FIRE TRUMPET etc) see especially column 3 line 23 to column 4 line 32 and column 6 lines 43-56	1
Y	US 4134092	(Ass. to GENERAL ELECTRIC CO) whole document	1

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).